

**CLAIMS**

1. A polymer composition comprising
  - a) a multimodal high density polyethylene (A); and
  - b) a low density polyethylene (B).
2. A composition according to claim 1 characterized in that the composition has a MFR<sub>2</sub>, according to ISO 1133, at 190 °C, of 5 to 20 g/10min.
3. A composition according to claim 2 characterized in that the composition has a density, according to ISO 1183-1987, of 930 to 950 kg/m<sup>3</sup>.
4. A composition according to any one of the preceding claims characterized in that the polyethylene (A) has a density, according to ISO 1183-1987, of 950 to 968 kg/m<sup>3</sup>.
5. A composition according to any one of the preceding claims characterized in that the polyethylene (A) has a melt flow rate MFR<sub>2</sub>, according to ISO 1133, at 190 °C, of 5 to 20 g/10 min.
6. A composition according to any one of the preceding claims characterized in that the polyethylene (A) has a weight average molecular weight M<sub>w</sub> of 50000 to 150000 g/mol.
7. A composition according to any one of the preceding claims characterized in that the polyethylene (A) is bimodal.
8. A composition according to any one of the preceding claims characterized in that the polyethylene (A) comprises ethylene homopolymer and/or ethylene copolymer.
9. A composition according to claim 8 characterized in that the ethylene copolymer comprises ethylene and at least one C<sub>3</sub> to C<sub>20</sub> α-olefine.

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10. A composition according to any one of the preceding claims characterized in that the comonomer content in the polyethylene (A) is 0.1 to 1.0 % by mole.
11. A composition according to any one of the preceding claims characterized in that the polyethylene (A) comprises a low molecular weight fraction (LMW) and a high molecular weight fraction (HMW).
12. A composition according to claim 11 characterized in that the polyethylene (A) comprises 40 to 60 % by weight of the low molecular weight fraction (LMW).
13. A composition according to claim 11 or 12 characterized in that the low molecular weight fraction (LMW) is a homopolymer.
14. A composition according to any one of the preceding claims 11 to 13 characterized in that the comonomer content is lower than 0.2 % by mole in the low molecular weight fraction (LMW).
15. A composition according to any one of the preceding claims 11 to 14 characterized in that the low molecular weight fraction (LMW) has a density, according to ISO 1183-1987, of at least 973 kg/m<sup>3</sup>.
16. A composition according to any one of the preceding claims 11 to 15 characterized in that the low molecular weight fraction (LMW) has a melt flow rate MFR<sub>2</sub>, according to ISO 1133, at 190 °C, of 100 to 2000 g/10 min.
17. A composition according to any one of the preceding claims 11 to 16 characterized in that the low molecular weight fraction (LMW) has a weight average molecular weight M<sub>w</sub> of 10000 to 60000 g/mol.
18. A composition according to any one of the preceding claims 11 to 17 characterized in that the high molecular weight fraction (HMW) is an ethylene copolymer.

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19. A composition according to claim 18 characterized in that the ethylene copolymer comprises ethylene and at least one C<sub>3</sub> to C<sub>20</sub>  $\alpha$ -olefine.
20. A composition according to any one of the preceding claims 18 to 19 characterized in that the comonomer content in the high molecular weight fraction (HMW) is 0.2 to 2.0 % by mole.
21. A composition according to any one of the preceding claims 18 to 20 characterized in that the high molecular weight fraction (HMW) has a weight average molecular weight M<sub>w</sub> of 80000 to 300000 g/mol.
22. A composition according to any one of the preceding claims characterized in that the polyethylene (B) is long chain branched.
23. A composition according to any one of the preceding claims characterized in that the polyethylene (B) has a density, according to ISO 1183-1987, of 910 to 935 kg/m<sup>3</sup>.
24. A composition according to any one of the preceding claims characterized in that the polyethylene (B) has a melt flow rate MFR<sub>2</sub>, according to ISO 1133, at 190 °C, of 3 to 15 g/10 min.
25. A composition according to any one of the preceding claims characterized in that the polyethylene (B) is a ethylene copolymer.
26. A composition according to claim 25 characterized in that the ethylene copolymer comprises ethylene and at least one component selected from the group consisting of vinyl acetate, vinyl acrylate, vinyl methacrylate, ethyl acrylate, methyl acrylate and butyl acrylate.
27. A composition according to any one of the preceding claims characterized in that the composition comprises 40 to 99 % by weight polyethylene (A) and 1 to 60 % by weight polyethylene (B).
28. A composition according to any one of the preceding claims characterized in that that the composition comprises additionally
  - c) other polymer(s) up to 20 % by weight.

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29. A composition according to any one of the preceding claims characterized in that that the composition comprises additionally
  - d) antioxidant(s) and/or process stabilizers of less than 2000 ppm.
30. A composition according to any one of the preceding claims characterized in that that the coated product comprising a composition according to any one of the claims 1 to 27, having a coating weight of  $20\text{g/m}^2$  has a vapor transmission rate (WVTR), according to ASTM E96, of less than  $15.5\text{g/m}^2/24\text{h}$ .
31. A multi-layer material comprising
  - a) a substrate as a first layer
  - b) a polymer composition according to any one of the preceding claims as at least a further layer.
32. A multi-layer material according to claim 31 characterized in that the substrate is selected from the group consisting of paper, paperboard, aluminum film and plastic film.
33. A process for producing a composition according to any one of the preceding claims 1 to 30 characterized in that
  - a) the polyethylene (A) is produced in a multistage process comprising a loop reactor and a gas phase reactor, wherein the low molecular weight fraction is generated in at least one loop reactor and the high molecular weight fraction is generated in a gas phase reactor
  - b) the polyethylene (B) is produced by a free radical polymerization in a high pressure autoclave process
  - c) polyethylene (A) and polyethylene (B) are blended together and compounded by using an extruder.
34. A process according to claim 33 characterized in that the catalyst used for the process producing the polyethylene (A) is a high activity pro-catalyst comprising a particulate inorganic support, a chlorine compound deposited on the support, wherein the chlorine compound is the same as or different from the titanium compound, whereby the inorganic support is contacted with an alkyl metal chloride which is soluble in non-polar hydrocarbon solvents, and has the formula  $(\text{R}_n\text{MeCl}_3$ .

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$n)_m$  wherein R is a  $C_1$ - $C_{20}$  alkyl group, Me is a metal of group III(13) of the periodic table,  $n = 1$  or  $2$  and  $m = 1$  or  $2$ , to give a first reaction product, and

the first reaction product is contacted with a compound containing hydrocarbyl and hydrocarbyl oxide linked to magnesium which is soluble in non-polar hydrocarbon solvents, to give a second reaction product, and the second reaction product is contacted with a titanium compound which contains chlorine, having the formula  $Cl_xTi(OR^{IV})_{4-x}$  wherein  $R^{IV}$  is a  $C_2$ - $C_{20}$  hydrocarbyl group and  $x$  is 3 or 4, to give the pro-catalyst.

35. A process for producing a multi-layer material according to any one of the claims 31 to 32 characterized in that polymer composition according to any one of the claims 1 to 30 is applied on the substrate by a film coating line comprising an unwind, a wind, a chill roll and a coating die.
36. Use of the polymer composition according to any one of the claims 1 to 30 for extrusion coating.
37. Use according to claim 36 characterized in that the polymer composition is used for extrusion coating producing a multi-layer material.